

Evaluating preanesthetic patients

A step-by-step approach helps you detect potential complications—and take action to prevent them.



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The purpose of a preanesthetic evaluation is to accurately assess and document a Pet's health status so that practitioners can better predict and prevent anesthesia-related complications to improve patient outcomes. Consistent use of a step-by-step preanesthetic evaluation helps ensure that each patient receives a thorough assessment and potential complications are recognized before anesthesia.

Evaluation and preparation

A complete patient evaluation should be performed before any anesthetic procedure and should consider signalment, medical history, physical examination findings and laboratory data (see *Evaluation Checklist*, page 31). Because the Pet's health status and disease history are critical factors in determining the appropriate anesthetic protocol, evaluation involves more than performing a battery of tests. It requires using the information to determine if anesthesia is appropriate and, if so, what is the safest regimen.

A Pet's signalment may warrant special consideration—age, sex and breed are equally important elements of the preanesthetic assessment. Drug dosages and responses vary among species and breeds and are important factors in the anesthetic equation.

A thorough medical history is also essential. It may reveal previous disease and anesthetic complications, concurrent medications or other facts (such as a recent meal) that may impact procedures. The veterinary team also needs to document preventive care treatments such as vaccinations, deworming, parasite control, dental care and disease screening tests. If you find preventive care deficiencies, take steps to correct them before performing an elective procedure. If the procedure cannot be postponed, avoid administering vaccinations and anthelmintic medications until the patient fully recovers from anesthesia.

It is also important to inform all participating team members of every procedure being performed on the patient as well as any medical history that could lead to an anesthetic complication. This ensures that

the entire team has received the same information, which minimizes the chance of miscommunication during anesthesia.

Physical examination

Before any anesthetic procedure, conduct a thorough physical examination and pay close attention to the Pet's body weight, sex and any undiagnosed masses, which should be carefully palpated. Record your findings in the patient's medical record. When possible, resolve any issues before anesthetizing the Pet.

A detailed evaluation of the cardiovascular, pulmonary and central nervous systems is vital as all anesthetic drugs depress cardiovascular and pulmonary function. The liver and kidneys also need specific assessment because of their role in metabolizing and eliminating anesthetic drugs. Again, any findings that are not within normal limits should be resolved before anesthesia. If they cannot be resolved, you may need to adjust the anesthetic protocol to ensure the Pet's safety.

Our practice uses a five-step approach in conjunction with a physical examination before any anesthetic procedure to assess major organ function and the Pet's overall health (see *Figure 1*, page 32). Here are the five steps:

1. Monitor capillary refill time, femoral pulse to heart rate ratio, pulse quality and heart rate. These parameters are key to evaluating perfusion before anesthesia. Adequate perfusion is vital to a successful anesthetic outcome.

2. Evaluate mucous membrane color for evidence of anemia, hyperemia (present with sepsis, hyperthermia or polycythemia), icterus or cyanosis.

3. Auscultate the heart. In young pa-

Evaluation Checklist

Medical history

Note any:

- Injuries
- Diseases
- Past anesthetic complications
- Concurrent medications

Physical examination

Findings are critical to outcome.

Thoroughly evaluate:

- Cardiovascular system
- Respiratory tract
- Hepatic function (blood work)
- Renal function (blood work)
- Central nervous system

Signalment

Consider:

- Species
- Breed
- Age
- Sex

Laboratory data

Evaluate:

- CBC
- Full chemistry panel

Practice tip:

It is often difficult to record an ECG on an awake Pet, as the alligator clips can be quite painful. Rather than attaching the alligator clips directly to the patient, use a 25-gauge hypodermic needle in the appropriate sites.

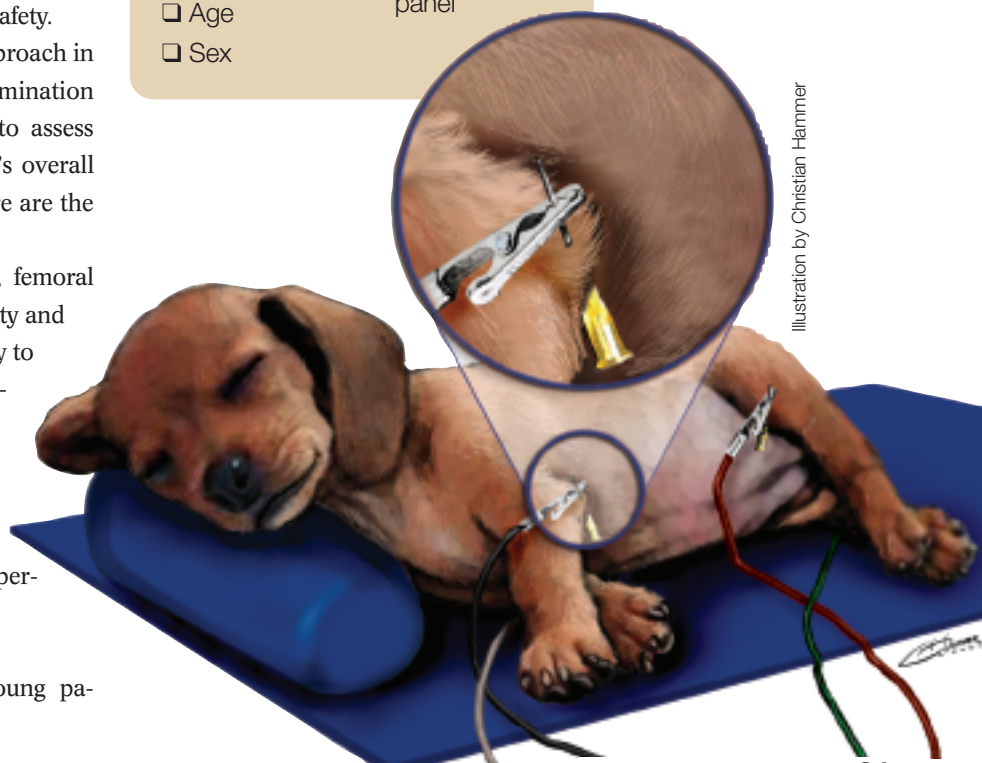
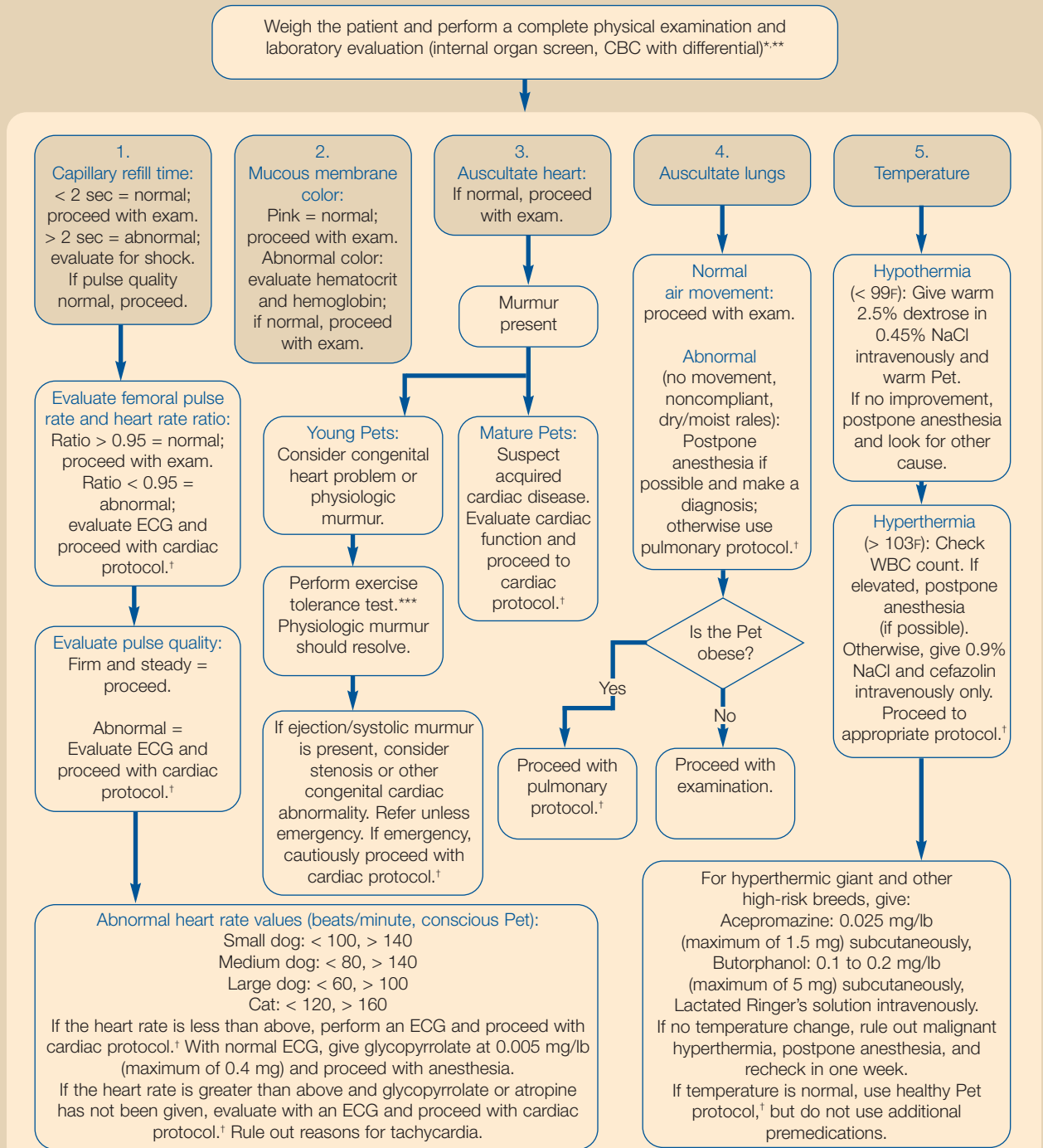


Illustration by Christian Hammer

Figure 1: Recommended Physical Examination Protocol Prior to Anesthesia



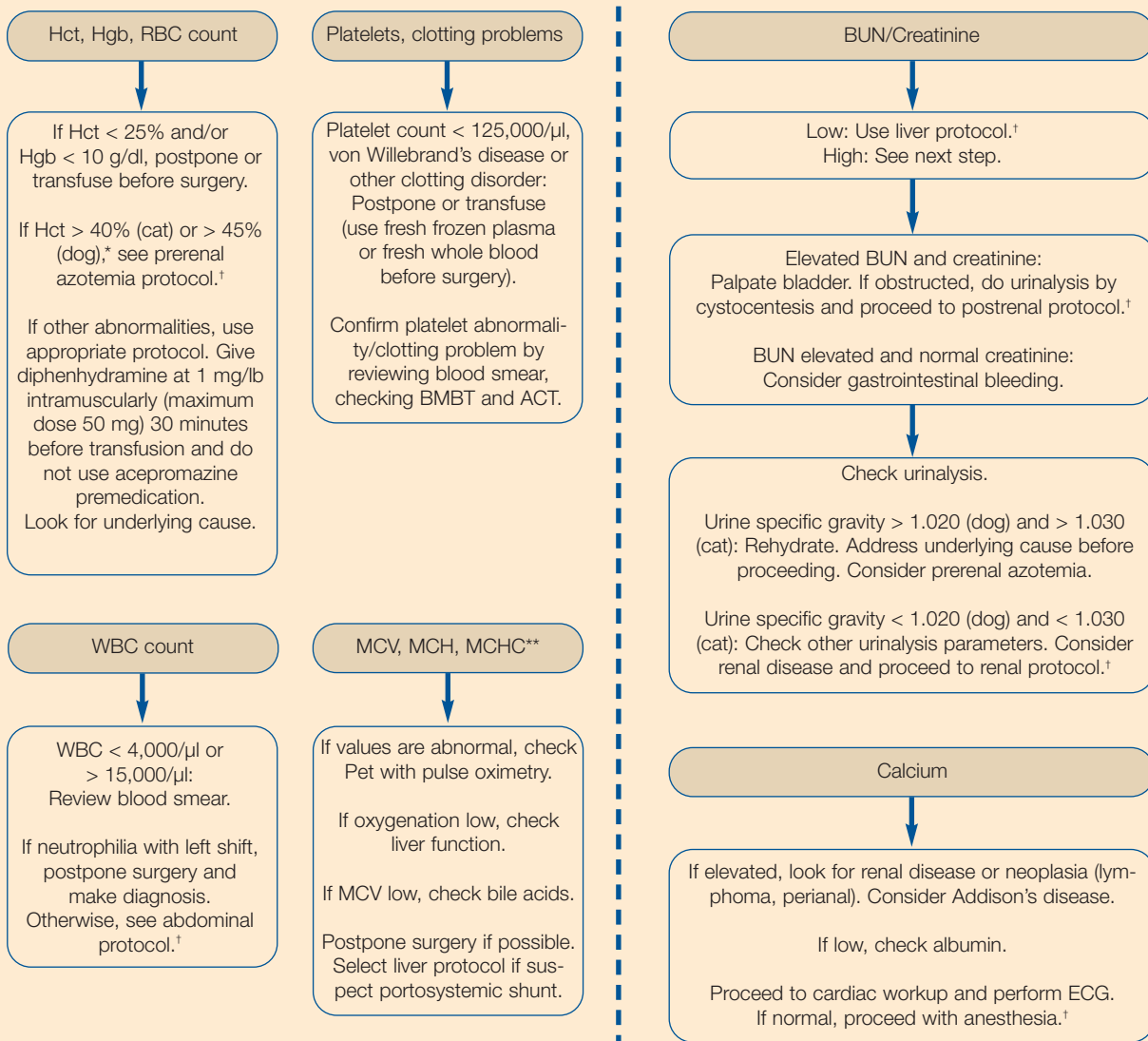
*Evaluate the history, including drug therapy, for bleeding disorders, hyperthermia, anesthesia problems, shunts, myopathies and pre-existing organ compromise.

**For a fractious Pet: Goal is to immobilize, obtain blood sample, place intravenous catheter and perform examination and evaluation immediately. The immobilizing agent should serve as the premedication or induction agent. Also see fractious Pet protocol.†

***Exercise tolerance test: Perform ECG and immediately walk dog vigorously for 10 minutes. Recheck ECG. Normal = heart rate increase is less than 25% of prewalk heart rate and returns to normal within five minutes.

†For the protocol, see *Anesthesia for the Pet Practitioner* by Will Novak, DVM, DABVP. To receive a copy, e-mail: banfieldjournal@banfield.net.

Figure 2: Preanesthetic Blood Work Evaluation



*Pets living in higher elevations and some breeds (Greyhounds) may have naturally occurring elevations in Hct.

**Normal adult vs. pediatric values will vary.

†For the protocol, see *Anesthesia for the Pet Practitioner* by Will Novak, DVM, DABVP. To receive a copy, e-mail: banfieldjournal@banfield.net.

ALT/Bilirubin/ALP

If elevated, evaluate for liver disease. If total bilirubin < 2.0 mg/dl, check bile acids and evaluate electrolytes. Consider radiographs and ultrasound.

If electrolytes abnormal, treat as cardiac case.

If liver disease present, avoid using acepromazine and proceed to liver protocol.[†]

Potassium

If high or low (suspected or documented), verify sample value.

Look for cause (check renal function and urinary tract for urethral blockage or ruptured bladder).

Proceed to cardiac protocol (perform ECG).[†]

Lipemia

See lipemia protocol.[†]

Albumin/total protein

If total protein < 3.5 g/dl, look for cause.

Give plasma if possible (administer diphenhydramine at 1 mg/lb [maximum dose 50 mg] intramuscularly before infusion; wait 30 minutes).

Remove acepromazine from premedication. Use healthy Pet protocol if no other abnormalities.[†]

Glucose

If < 100 mg/dl, look for cause. Start 2.5% dextrose in 0.45% NaCl intravenously. Go to healthy Pet protocol.[†]

If > 200 mg/dl, do serum fructosamine test and postpone anesthesia.

If serum fructosamine test elevated, use diabetic protocol[†] or postpone anesthesia and stabilize Pet.

Quiz Answers

(see page 41)

1. < 0.95
2. All of the above are correct.
3. All of the above are correct.
4. Complete the physical examination and blood work and use a pulmonary protocol if everything else is normal.
5. Start stabilization therapy, decompress the stomach, and start blood work.
6. Postpone anesthesia, further evaluate underlying cause(s) of examination and blood work abnormalities.

Case Scenario

Two 6-month-old Shih Tzus, Dan and Annie, were scheduled for an elective neuter and ovariohysterectomy, respectively. The doctor reviewed each Pet's medical record and found no abnormalities or concerns. Physical examinations of both Pets were within normal parameters. Blood was drawn for complete blood counts (CBCs) and serum chemistry profiles. Annie's results were within normal parameters. BUN and creatinine levels were moderately elevated on Dan's serum chemistry profile.

The doctor called the client to discuss Dan's abnormal findings, and the client agreed to have a urinalysis performed to further evaluate Dan's kidney function. The urinalysis results were within normal parameters other than isosthenuric urine. The doctor and client agreed to proceed with Annie's ovariohysterectomy using a healthy Pet anesthesia protocol. Dan's surgery was postponed until radiographs and an ultrasound could be performed to evaluate for renal disease.

Outcome

Annie's ovariohysterectomy was uneventful. Dan, however, was diagnosed with renal dysplasia. Although the client was upset to hear her dog was ill, she was happy that the doctor detected the abnormality before surgery. The client had previously owned another male Shih Tzu that underwent an elective neuter at 6 months of age without any preanesthetic blood work. Two weeks after the procedure, the Pet was euthanized because of renal failure. The client was devastated by the event, and she felt it may have been avoided if her dog had been properly evaluated before surgery.

tients, a murmur may indicate a congenital heart abnormality. Generally, congenital heart defects pose a considerable risk of an adverse anesthetic event. Such patients should be considered high-risk and undergo anesthetic procedures only at a practice equipped to address these special needs. In adults, it is important to know if this is a new finding or if there is evidence of disease progression or signs of heart failure. If any complications exist, a cardiac workup should be completed before anesthesia, if possible.

4. Auscultate the entire lung field to ensure normal sounds, airflow, oxygenation and ventilation.

5. Evaluate the patient's temperature for hypothermia or hyperthermia. Both are im-

portant, and the cause needs to be identified and corrected before anesthesia.

This approach allows accurate evaluation of the Pet's condition and helps detect abnormal findings. When problems are recognized, the protocol provides guidelines for proceeding with the anesthetic procedure.

Laboratory data

Perform a routine complete blood count (CBC) and serum chemistry profile, preferably within 48 hours of the anesthetic procedure. This allows you to evaluate the Pet's current health status. Laboratory data are especially important in apparently healthy patients to ensure that potential problems are uncovered. You may need to request additional diagnostics depending on the

findings gathered from the medical history and physical examination.

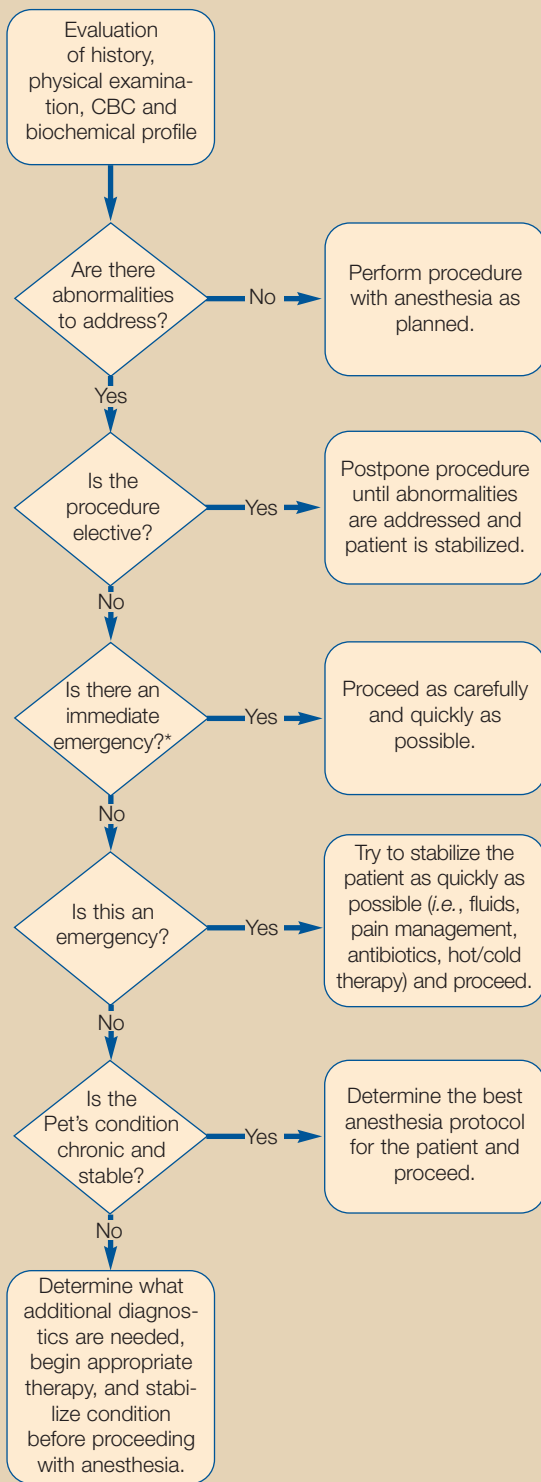
If you discover abnormalities, try to correct them before anesthesia, with the goal of preventing or minimizing adverse events. An ill patient's condition and laboratory values can change in just a few hours. In these situations, it is best to collect and evaluate the CBC and serum chemistry profile just before the anesthesia procedure.

Using a systematic approach to evaluating laboratory data lets you address abnormal results in a timely fashion (see *Figure 2*, pages 34-35). Much like the physical examination algorithm, this system guides practitioners through the appropriate diagnostic tests, such as urinalysis, bile acids testing, electrocardiogram (ECG), ultrasound and support-

ive care, depending on the findings. By appropriately and thoroughly addressing aberrant findings before anesthesia, you place the patient in the best possible condition to undergo the procedure.

Many compromised patients have electrolyte abnormalities. Depending on the underlying cause, abnormalities may or may not be clinically significant. If you do not have an in-house electrolyte analyzer and cannot wait for evaluation from a reference laboratory, you can perform an ECG. Significant deviations in electrolyte values can affect cardiac function and may show up as deviations to the normal ECG pattern. For example, hyperkalemia frequently produces decreased P waves, increased PR intervals and spiked T

Figure 3: Anesthesia Decision Protocol



*An immediate emergency is when a patient cannot breathe or is bleeding from a major vessel and needs to be under anesthesia in less than 15 minutes.

waves. Address any abnormalities before anesthesia.

Lipemic blood samples may be seen if the patient has recently eaten or if there is an underlying condition such as hypothyroidism, diabetes mellitus, pancreatitis or primary hyperlipidemia. Additionally, lipemia can interfere with some serum chemistry profile results. If you discover lipemia, wait a few hours and draw a new blood sample for evaluation. If the second sample is also lipemic, you may want to evaluate further. If you cannot delay anesthesia, then use an anesthesia protocol without propofol. Propofol may be contraindicated in patients with lipemia.

Additional preanesthetic diagnostics may include specific serum chemistries, blood pressure testing, radiography, ultrasound, microbiology, toxicology, cytology, coagulation tests or serum electrolytes. Every test can help you determine whether anesthesia is safe and in the Pet's best interest.


This approach to evaluating the preanesthetic patient helps you determine the best anesthesia protocol for the Pet (see *Figure 3*). Once you have administered premedications, it is essential to re-evaluate the Pet's major organ systems using the five-step approach previously discussed because administered drugs can have profound effects on cardiovascular and pulmonary systems before anesthesia induction. This evaluation may change your intended anesthetic protocol or prompt you to postpone anesthesia to further evaluate unexpected findings.

Conclusion

When preanesthetic evaluation reveals abnormalities, it is the practitioner's responsibility to appropriately address each one before proceeding. How do you define

“appropriately address”? There is no simple answer; it depends on the situation and the abnormality.

Ideally, the practitioner decides if further diagnostics or supportive care is necessary. How long to administer supportive care before the anesthetic procedure (minutes, hours, days, weeks) is based on the practitioner’s assessment. In emergency situations, the patient may be stabilized for only a short time—for example, time enough to administer shock fluids to optimize perfusion. On the other hand, elective procedures may be delayed until the abnormalities are resolved or stabilized. In all cases, the practitioner’s goal is to place the patient in the best condition possible before the anesthetic procedure or decide anesthesia is not in the Pet’s best interest.

Ideally, the patient’s condition on recovery should be as good as or better than it was before anesthesia. 

Selected Reading

1. Muir WW, Hubbell JA, Skarda RT, et al. *Handbook of Veterinary Anesthesia*. 3rd Ed. St. Louis: Elsevier Health, 2000.
2. Pratt PW, *Principles and Practice of Veterinary Technology*. St. Louis: Mosby Publishing, 1998;357-367.

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Testing Your Knowledge

- 1.** On the physical examination, what is considered an abnormal pulse ratio?
- > 0.97
 - < 0.95
 - < 0.97
 - = 0.98
 - > 0.98
- 2.** When evaluating blood work:
- A decrease in the BUN might indicate the need to check liver function.
 - Abnormal calcium levels would indicate the need for an ECG prior to surgery.
 - If the ALT is elevated, then electrolytes should be reviewed.
 - If the total protein and albumin are low, a plasma transfusion is indicated before surgery.
 - All of the above are correct.
- 3.** When evaluating blood work:
- If potassium is abnormal, evaluate an ECG and follow a cardiac protocol.
 - If glucose is less than 100 mg/dl, the patient should be started on 2.5% dextrose.
 - If glucose is greater than 200 mg/dl, evaluate serum fructosamine and postpone surgery.
 - If BUN is high, palpate the bladder and check for an obstruction.
- All of the above are correct.
- 4.** An obese, 17-lb cat is presented for a routine dental prophylaxis. Auscultation of the lungs is normal. What should you do?
- Complete the physical examination and blood work and use a pulmonary protocol if everything else is normal.
 - Evaluate thoracic radiographs and look for pneumonia.
 - Postpone anesthesia until the Pet is an acceptable weight, as this Pet is probably hypothyroid.
 - Use a healthy Pet protocol. Administer a blood transfusion prior to anesthesia.
- 5.** You are presented with a patient that has developed acute abdominal pain. Radiographs reveal gastric volvulus and gas accumulation. What should you do next?
- Go directly to surgery and do an exploratory laparotomy.
 - Start stabilization therapy, decompress the stomach, and start blood work.
 - Proceed to surgery using a pulmonary protocol, as many patients with this history have breathing problems.
- Check clotting profile and transfuse if abnormal. Administer metoclopramide.
- 6.** A 12-year-old spayed, domestic shorthaired cat presents for a routine dental prophylaxis. The cat appears nervous. Physical examination reveals a heart rate of 200, severe dental calculus with gingivitis, and a normal body weight. The preanesthetic CBC and biochemical profile reveal an ALT of 150 U/L (high normal is 100), and a Hct of 46%. All other parameters are within normal limits. What steps should be taken?
- Heart rate, Hct and ALT are not significant; proceed with dental prophylaxis using a healthy Pet protocol.
 - Heart rate is increased, Hct and ALT are not significant; proceed with dental prophylaxis using a cardiac protocol.
 - Heart rate and Hct are not significant; proceed with dental prophylaxis using a hepatic protocol.
 - Postpone anesthesia, further evaluate underlying cause(s) of physical examination and blood work abnormalities.

Answers on page 35